BUREAU OF WATER

South Carolina Department of Health and Environmental Control

SHELLFISH MANAGEMENT AREA 11

2006 ANNUAL UPDATE

Shellfish Sanitation Program

Water Monitoring, Assessment and Protection Division
Environmental Quality Control - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201

July 2006

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South Carolina Department of Health and Environmental Control

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2006 ANNUAL UPDATE

[Data Thru December 2005]

Shellfish Management Area 11
Shellfish Sanitation Program

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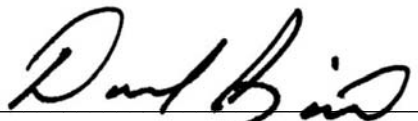

David G. Baize, Division Director
Water Monitoring, Assessment, and Protection Division
Environmental Quality Control - Bureau of Water

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ANNUAL UPDATE
Shellfish Management Area 11
SCDHEC EQC Bureau of Water

Data Inclusive Dates:
01 / 01 / 03 thru 12 / 31 / 05

Classification Change:
___ Yes __X__ No

Shoreline Survey Completed: Yes

Prior Report & Date: Annual - 2005

(I)ncreased/(D)ecreased/(N)one:
__N__ Approved
__N__ Conditionally Approved
__N__ Restricted
__N__ Prohibited

SUMMARY

Bacteriological water quality in Shellfish Growing Area 11 appears to be relatively stable, and no changes in classification are recommended for this survey period. The upland shores along the northern part of the Stono River, as well as along Bass Creek, Cinder Creek and Kiawah River all are being heavily developed. Stormwater runoff likely impacts water quality in these areas.

The Department recently completed performing a series of special bacteriological sampling throughout the length of Abbapoola Creek that will hopefully better identify pollution sources within the area

Although the water quality at stations 11-12 and 11-15 meets Approved area criteria, these stations will retain their Restricted classification due to water quality at adjacent stations 11-27, 12A-41, and 12B-02.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47, which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The United States Food and Drug Administration (USFDA) use The National Shellfish Sanitation Program's (NSSP) *Guide for the Control of Molluscan Shellfish* to evaluate state

shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and South Carolina Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved - Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations which would render shellfish unsafe for human consumption. The Approved area classification shall be designated based upon a sanitary survey, which includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, and not more than ten percent of the samples shall exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform MPN shall not exceed fourteen per one hundred milliliters, and the estimated ninetieth percentile shall not exceed an MPN of forty three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Conditionally Approved - Growing areas may be classified Conditionally Approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

Restricted - Growing areas shall be classified Restricted when sanitary survey data show a limited degree of pollution or the presence of deleterious or poisonous substances to a degree which may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved classification is not feasible. Shellfish may be harvested from areas classified as Restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. For Restricted areas to be utilized

as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Conditionally Restricted - Growing areas may be classified Conditionally Restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as Conditionally Restricted. Where appropriate, the management plan for each Conditionally Restricted area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems and an evaluation of each source of pollution) and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as Conditionally Restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For Conditionally Restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of Conditionally Restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Prohibited - Growing areas are classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities which could render shellfish unfit or unsafe for human consumption.

BACKGROUND INFORMATION

This sanitary survey evaluates the current harvesting classification of shellfish growing waters designated as Shellfish Management Area 11. Area 11 consists of approximately 29,273 acres of shellfish growing area habitat located in Charleston County, South Carolina. Area 11 consists of the Stono River and its tributaries including Elliott Cut, Abbapoola, Bass, Cinder, Green, Log Bridge and Rantowles Creeks and a portion of New Cut as well as the Kiawah River and its tributaries including Bryans, Captain Sams and Mullet Hall Creeks.

The harvesting classification of Area 11 prior to this sanitary survey was as follows:

Prohibited: (Administrative Closure)

1. Those waters of Elliott Cut and Wappoo Creek and all adjacent marshland;
2. Those waters of the Stono River from approximately 1,000 feet south of the Stono Marina to approximately 1,000 feet north of Buzzard's Roost Marina;
3. Those waters within approximately 1000 feet of the Ross Marine facility.

Restricted:

1. Those waters of the Stono River and adjacent marshlands, extending from the Prohibited closure around Buzzard's Roost Marina, northward to the boundary with Area 12B, excluding the Ross Marine Prohibited closure zone;
2. Those waters of New Cut Creek and adjacent marshlands, extending from the Stono River to the boundary with Area 12A;
3. Those waters of Abbapoola Creek and adjacent marshlands, from Station 6 to its headwaters;
4. Those waters of Bass Creek and adjacent marshlands, from its headwaters to its confluence with Cinder Creek.

Approved: All other waters in Area 11.

The shellfish industry in South Carolina is based primarily on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams, which include both the northern clam (*Mercenaria mercenaria*) and several small populations of the southern clam (*Mercenaria campechiensis*). Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State shellfish grounds, culture permits, and Kings Grant areas. The ribbed mussel (*Geukensia demissa*) is also harvested in South Carolina on a small scale by the general public for recreational harvest.

There are two State Shellfish Grounds (S) within Area 11, S-194 and S-189. There are two Recreational Shellfish Grounds(R), R-186 and R-193. There are multiple culture (C) and mariculture (M) permit leases throughout the southern portion of the area.

The shellfish-harvesting season in South Carolina normally extends from mid-September through mid-May. The SCDNR has the authority to alter the shellfish-harvesting season for resource management purposes and grant permits for year-round mariculture operations. Additionally, the South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

CHANGES IN POLLUTION SOURCES

Minor changes in pollution sources have occurred in Area 11 since the 2005 report.

SURVEY PROCEDURES

Shoreline surveys were conducted by the Trident District Shellfish Sanitation Staff, by watercraft, vehicle and on foot, during the survey period and are ongoing. Extensive visual examinations of lands adjacent to the waters of Area 11 were conducted to determine potential sources of pollution entering shellfish growing waters.

POINT SOURCE POLLUTION

A. **Municipal and Community Waste Treatment Facilities** - There are no permitted wastewater facility outfalls within Area 11. The Charleston Commissioners of Public Works wastewater plant located between sample points 11-27 and 11-02 has been closed and inactivated. There are, however, two waste treatment facilities within Area 11 that have been issued land application permits. One is on Kiawah Island (ND0017361) and the other is on Seabrook Island (ND0063347). There is also a Reverse Osmosis (RO) plant (SC0048186) located within Area 11. It is located on Seabrook Island and has been issued to Kiawah Resort\Cassique Golf Course. The discharge is only permitted to discharge concentrated salt residue. These three facilities are depicted on the attached Potential Pollution Source Map.

B. **Industrial Waste (Discharges)** - There is one permitted industrial wastewater discharge located within the boundary of Area 11. The Three Oaks/Chicken Farm Mine (SCG730083) is a borrow pit located at the headwaters of Hut Creek. The permit was issued to address de-watering of the excavated area. This discharge is depicted on the attached Potential Pollution Source map.

C. **Marinas** – South Carolina Regulation 61-47, Shellfish defines *Marina* as "any water area with a structure (docks, basin, floating docks, etc.) which is: 1) used for docking or otherwise mooring vessels; and, 2) constructed to provide temporary or permanent docking space for more than ten boats, or has more than 200 linear feet of docking space." Area 11 supports a wide variety of boating facilities. There are two recreational marinas located on the Stono River. The Buzzards Roost and Stono marinas are on either side of the Highway 700 Bridge adjacent to Station 02. The marinas provide dockage for approximately 105 boats collectively. Closure zones are in place, extending approximately 1,000 feet south of the Stono Marina to approximately 1,000 feet north of Buzzard's Roost Marina. Ross Marine has a small commercial marina holding approximately 15 boats. A closure zone is in place extending approximately 1,000 feet from the Ross Marine facility. All three marinas offer pump out of on-board sewage. There are no commercial fisheries docking facilities within Area 11.

D. **Radionuclides** - Sources of radionuclides have not been identified within Area 11, and radionuclide monitoring has not been conducted. No other sources of poisonous or deleterious substances have been identified within the area.

NONPOINT SOURCE POLLUTION

A. **Urban and Suburban Stormwater Runoff** - The shoreline survey conducted in Area 11 revealed the highest concentration of homes to be along the Stono River around Elliott Cut. The remaining portions of the Stono and the Kiawah Rivers have single-family residences along the shoreline. The shoreline survey has revealed that residential construction continues at a rapid rate, along the Stono River from Limehouse Bridge south to Goshen Point, and along both Bass and Cinder Creeks.

There are approximately 201 stormwater permits that have been issued within the Charleston County area. The majority of the permits have been issued to construction sites and/or housing subdivisions; the remaining for stormwater control for schools, churches, and small businesses. These areas are depicted on the attached Potential Pollution Source Map. The Army Corps of Engineers conducted no dredging activities during the review period.

The uplands surrounding the shellfish growing waters of Area 11 consist of various soil textures. The United States Department of Agriculture (USDA), Soil Conservation Service (Charleston Co.1971) utilizing general classifications and descriptions, has defined these soils. Although lands within Area 11 consist of numerous soil types, the area is generally comprised of Yonges-Hockley-Edisto soils made up of low broad plains, which are randomly spaced drainage-ways that lead to tidal streams. The USDA (1971) further describes these soils as moderately well drained to poorly drained, nearly level soils that have a sandy surface layer and predominantly loamy subsoil.

B. **Agricultural Runoff** - There is one permitted agricultural facility located in Area 11. The facility is a small dog kennel located approximately 1.5 miles southwest of the Highway 700 bridge over the Stono River. The shoreline survey found a significant amount of pasture and farm land throughout the Johns Island portion of the area. Two horse farms were noted in the area of Abbapoola Creek. The Clemson Extension Station located on Highway 17-South utilizes various types of fertilizers on select crops on their property for research purposes.

C. **Individual Sewage Treatment and Disposal Systems** - In Area 11, the entirety of Johns Island along River Road is served by individual septic systems. Public sewer does not serve areas to the west of Main Road. There are sporadic septic tanks on Kiawah Island, mostly along the eastern end of the island. There have been no reported septic tank failures documented by the Division of Environmental Health. Each system is required to be inspected and approved before final installation by the Division of Environmental Health, Trident Health District.

D. **Wildlife and Domestic Animals** - Area 11 supports a large population of domestic animals attributable to the number of private residences along the shores of the Stono River. There is a limited amount of wildlife on James Island and Johns Island due to the amount of urban sprawl or cultivated/pasture lands. An elaborate wildlife management program exists throughout Kiawah Island. The island has an intensive deer population control project and 35 bobcats are tracked with radio collars. A wildlife preserve is located at the northeast corner of the island that consists of several fresh and brackish ponds that drain into Cinder Creek There are many small tidal creeks throughout the area. This creek system provides a conduit for animal fecal coliform bacteria to be transported to the adjacent growing waters.

E. **Boat Traffic** - Recreational boat traffic is moderate throughout the year. Commercial fisheries boats, ranging in size from 16 to approximately 50 feet, operate in the area in accordance with product demand. The northern portion of the Stono River (from Goshen Point to Elliott Cut) is part of the AIWW. The waterway supports most of the recreational boat traffic.

F. **Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas requires both State and Federal approval. Portions of the AIWW require maintenance dredging. The United States Army Corps of Engineers utilizes designated tracts of land adjacent to the AIWW as dredge spoil sites.

G. **Marine Biotoxins** - Bivalve shellfish contamination from marine biotoxins has not been shown to be a human health concern within Area 11. The Department participates in a State Task Force on Toxic Algae and maintains a Toxic Algae Emergency Response Team.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

PHYSIOGRAPHY

Area 11 consists of the Stono River and its tributaries including Elliott Cut, Abbapoola, Green, Hut, Log Bridge and Rantowles Creek and a portion of New Cut as well as the Kiawah River and its tributaries including Bass, Bryans, Captain Sams, Cinder and Mullet Hall Creeks. Due to minimal shoaling in both the Stono and Kiawah Rivers, dredging occurs on an infrequent basis. Freshwater flows into the area from Elliott Cut; however, most freshwater enters the area by way of overland runoff from rainfall events. High salinity ocean water enters the area from the Stono Inlet at the southeast corner of the area and Captain Sam's Inlet, which is shared by Kiawah and Seabrook Islands at the southwest corner of the area. The entire area is approximately 16 miles wide (west to east) and 19 miles long (north to south).

Tides - Tides in Area 11 are semidiurnal, consisting of two low and two high tides occurring each lunar day. Mean tidal ranges in the Stono River at Elliott Cut are 5.2 feet during normal tides and 6.8 feet during spring tides. Wind direction and intensity, as well as atmospheric pressure, typically cause variations in predicted tidal ranges.

Rainfall - Precipitation in Area 11 is heaviest during late summer and early autumn. Tropical storms and hurricanes occasionally produce extremely large amounts of rainfall. During winter months heavy rainfall events are uncommon, yet occasional intense thunderstorms associated with rapidly moving low-pressure systems generate heavy rains. Precipitation rarely occurs in the form of snow or ice. Spring weather patterns may be dynamic with associated thunderstorms and severe weather conditions.

The yearly rainfall average for a thirty-year period in Charleston, recorded at the Charleston Airport, is 50.5 inches. The 2005 precipitation total recorded at Plum Island on James Island was 64.05 inches.

Winds - Prevailing winds along the central portion of the South Carolina coast are from the south and west during spring and summer and from the north during autumn and winter. Wind speeds are generally less than 15 miles per hour (mph); however, strong weather systems may generate winds in excess of 25 mph. Tropical storms and hurricanes occasionally occur.

River Discharges - Freshwater rivers do not discharge directly into Area 11. Freshwater influence is primarily due to rainfall and associated drainage and runoff.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 11 in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July 1998, an updated shellfish water quality data scheduling and collection procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station, yet provides a six-sample cushion (above the NSSP required 30 minimum) for broken sample bottles, lab error, breakdowns, etc. This also allows each annual report's water quality data to meet the requirements for the NSSP Triennial Review sampling criteria.

Nine hundred six (906) SRS routine surface water quality samples (<1.0 ft deep) were collected for bacteriological analyses from twenty-six (26) active water quality sampling stations in Area 11 during the period 01/01/03 through 12/31/05. Nineteen (19) special samples were taken associated with a September 2003 rainfall closure. The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to the South Carolina Department

of Health and Environmental Control's Region 7 Environmental Quality Control Laboratory in North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment for the purpose of temperature control. At the laboratory, sample sets exceeding a 30-hour holding time or containing a temperature control in excess of 10 degrees Centigrade were discarded (APHA, 1970).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using an automatic temperature compensated refractometer. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined by using Nautical Software's *Tides & Currents*, Version 2 (1996).

MONITORING RESULTS

Stations exceeding a fecal coliform geometric mean MPN value of 14 were 11-6A, 11-16, 11-17, 11-18, 11-27 and 11-35. No station exceeded a fecal coliform geometric mean MPN value of 88. Stations that exceeded a fecal coliform MPN estimated ninetieth percentile value of 43 were 11-6A, 11-16, 11-17, 11-18, 11-27, and 11-35. No station exceeded an estimated ninetieth percentile fecal coliform MPN value of 260.

For information purposes only, data collected from October to December 2005 was excluded (see Table #2-A) as the entire area was in a closed status due to a rainfall closure. Water quality at all sampling stations was negatively impacted by this rainfall event. Exclusion of these three data sets does not alter any classification boundaries; however, the Amended Data Summary will be included in this survey for possible use in future surveys.

CONCLUSIONS

Based on review of fecal coliform bacteriological data and the pollution source survey, Area 11 appears to be impacted primarily by non-point source pollution.

NONPOINT SOURCE RUNOFF

Stormwater runoff appears to be the primary route of fecal coliform bacteria contamination into the area. Development of the surrounding upland is occurring along the upper Stono River, between the Limehouse Bridge and Goshen Point, and on the northern half of Kiawah Island, adjacent to Bass and Cinder Creeks. Natural vegetation is often removed from these waterfront properties. Overland runoff from rainfall and from residential outdoor water use could lower water quality by allowing fecal coliform bacteria to be transported more quickly to shellfish harvesting areas.

RECOMMENDATIONS

Bacteriological water quality in Shellfish Growing Area 11 appears to be relatively stable, and no classification changes are recommended for this survey period. The upland shores along the northern part of the Stono River, as well as along Bass Creek, Cinder Creek and Kiawah River all are being heavily developed. Stormwater runoff likely impacts water quality in these areas.

The Department performed a series of special samples throughout the length of Abbapoola Creek to help identify pollution sources. Hopefully the results of that study will help identify pollution sources in that area.

Although the water quality at stations 11-12 and 11-15 is Approved, these stations will retain their Restricted classification due to water quality at adjacent stations 11-27, 12A-41, and 12B-02.

The following harvesting classification of Area 11 is recommended:

Prohibited: (Administrative closure)

1. Those waters of Elliott Cut and Wappoo Creek and all adjacent marshland;
2. Those waters of the Stono River from approximately 1,000 feet south of the Stono Marina to approximately 1,000 feet north of Buzzard's Roost Marina;
3. Those waters within approximately 1,000 feet of the Ross Marine facility.

Restricted:

1. Those waters of the Stono River and adjacent marshlands, extending from the Prohibited closure around Buzzard's Roost Marina, northward to the boundary with Area 12B, excluding the Ross Marine Prohibited closure zone;
2. Those waters of New Cut Creek and adjacent marshlands, extending from the Stono River to the boundary with Area 12A;
3. Those waters of Abbapoola Creek and adjacent marshlands, from Station 6 to its headwaters;
4. Those waters of Bass Creek and adjacent marshlands, from its headwaters to its confluence with Cinder Creek.

Approved: All other waters in Area 11.

Station addition/deactivation/modification:

Addition: Station 11-02A, 32.748045, -80.008962**; Stono River - southern boundary of the marina closure zone, south of Hwy. 700 Bridge.**

Reactivation: Station 11-01, 32.7658333, -80.0041667; **Elliott Cut at Stono River.**

Analysis of sampling data for Area 11 demonstrates the probability of a significant impact

from rainfall exceeding 4.00" in a 24-hour period. Therefore, a precautionary closure of Area 11 will be implemented following rainfall events of greater than 4.00" in a 24-hour period, as measured at the Charleston Commissioners of Public Works, Plum Island Wastewater Treatment Plant located on James Island. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States are published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (*National Research Council, 1985*).

REFERENCES

American Public Health Association, Inc., *Procedures for the Bacteriologic Examination of Sea Water and Shellfish*, 1970, pp. 28-47, *Recommended Procedures for the Examination of Sea Water and Shellfish*, 4th ed., Library of Congress, Washington, D.C.

National Research Council, 1985, "*Safety of Dams - Flood and Earthquake Criteria,"* National Academy Press, Washington DC.

National Shellfish Sanitation Program (NSSP) -- *Guide for the Control of Molluscan Shellfish*, 1997 Revision, U.S. Department of Health and Human Services, Washington, D.C.

National Weather Service, The National Oceanic and Atmospheric Administration, *Precipitation Frequency Atlas of the Western US: NOAA Atlas II* - Superintendent of Documents, US Government Printing Office, Washington DC.

United States Department of Agriculture, Soil Conservation Service, 1971, *Soil Survey of Charleston County, South Carolina.* In cooperation with South Carolina Agricultural Experiment Station and South Carolina Land Resources Conservation Commission, National Cooperative Soil Survey, Washington, D.C. p. 78.

TABLE #1
Shellfish Management Area 11

Water Quality Sampling Stations Description

Station	Description
01	Elliot Cut at Stono River (Reactivate 1/1/07)
02	Stono Bridge at S. C. Highway 700
02A	Stono River - Southern Boundary of the MCZ, S. of Hwy. 700 Bridge (New 1/1/07)
03	Docks between Markers 10 & 11 in Stono River
05	Mouth of Abbapoola Creek
06	Abbapoola Creek at first large bend
06A	Abbapoola Creek at confluence with small creek on west bank at seventh bend
07	Green Creek at Stono River
07A	Green Creek, four bends upstream of Station 11-07 (Activate - January 2006)
08	Mouth of Kiawah River
10	Kiawah River at Kiawah Island Boat Landing (Deactivate - January 2006)
12	Confluence of AIWW and creek just north of Marker #27
15	Stono River (AIWW) at Marker #63
16	Stono River (AIWW) at Marker #51
17	Stono River (Log Bridge Creek) at Marker #54
18	Confluence of Rantowles Creek and Stono River
19	Middle of Stono Inlet (Deactivate - January 2006)
21	South Kiawah River on the flats
22	Kiawah River POG at Mingo Point
23	Captain Sam's Creek and Kiawah River
27	Stono River at mouth of creek (Penny Creek) near Marker #25
28	Mullet Hall Creek 150 yards from mouth at fork
29	Kiawah River between Bryans Creek & Mullet Hall Creek
30	Kiawah River at mouth of Bryans Creek
31	Bass Creek at confluence with Kiawah River
32	Bass Creek at confluence with Cinder Creek
33	Sol Legare Boat Landing
34	Cinder Creek at Public Dock (3^{rd} Bend from confluence with Bass Creek)
35	Bass Creek at Public Dock (5^{th} Bend from confluence with Cinder Creek)

(Total 26 Active for CY 2005)

Figure 1.

Shellfish Management Area 11 Prior Classification

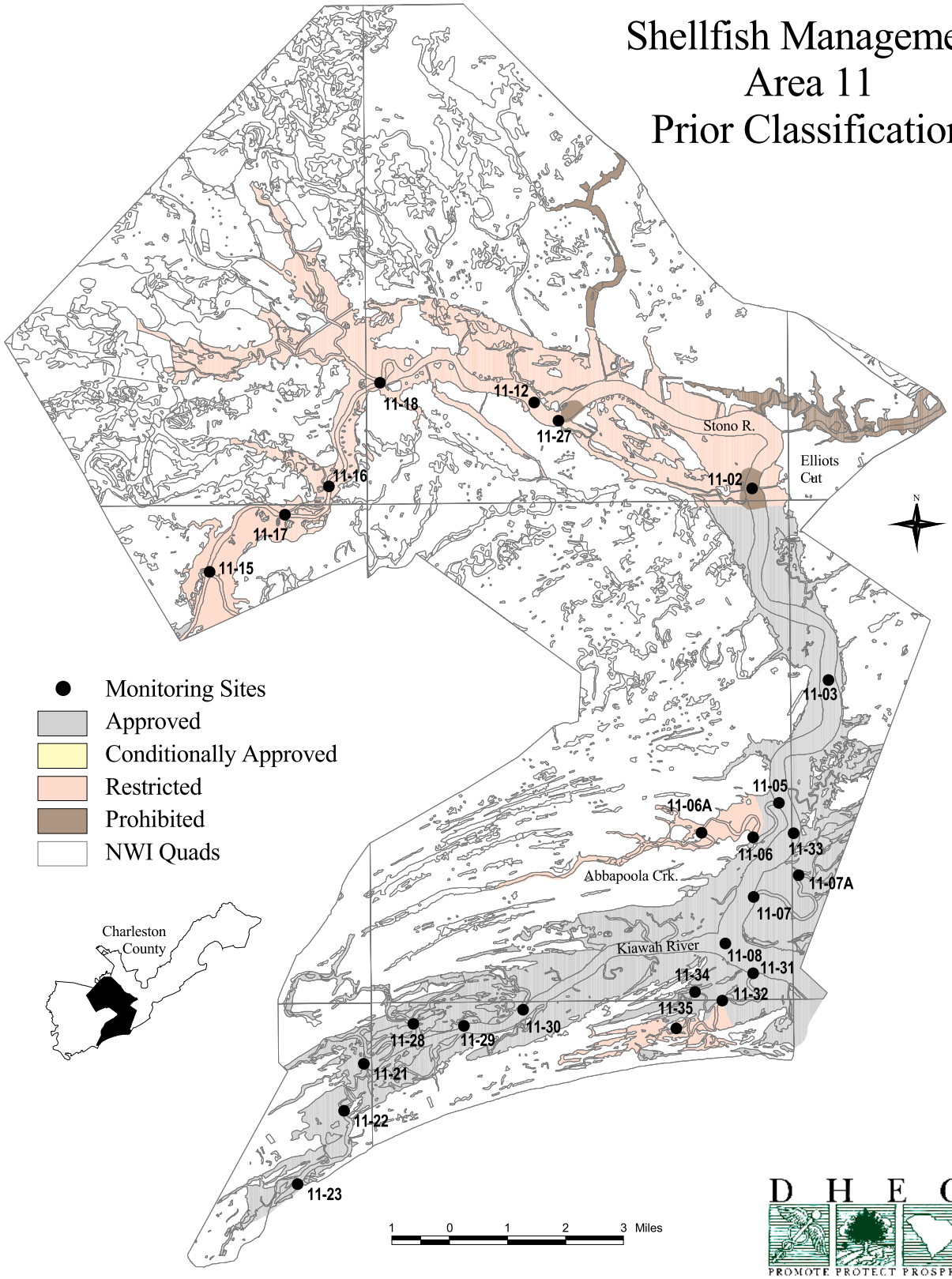

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Figure 2.
Shellfish Management Area 11
Current Classification

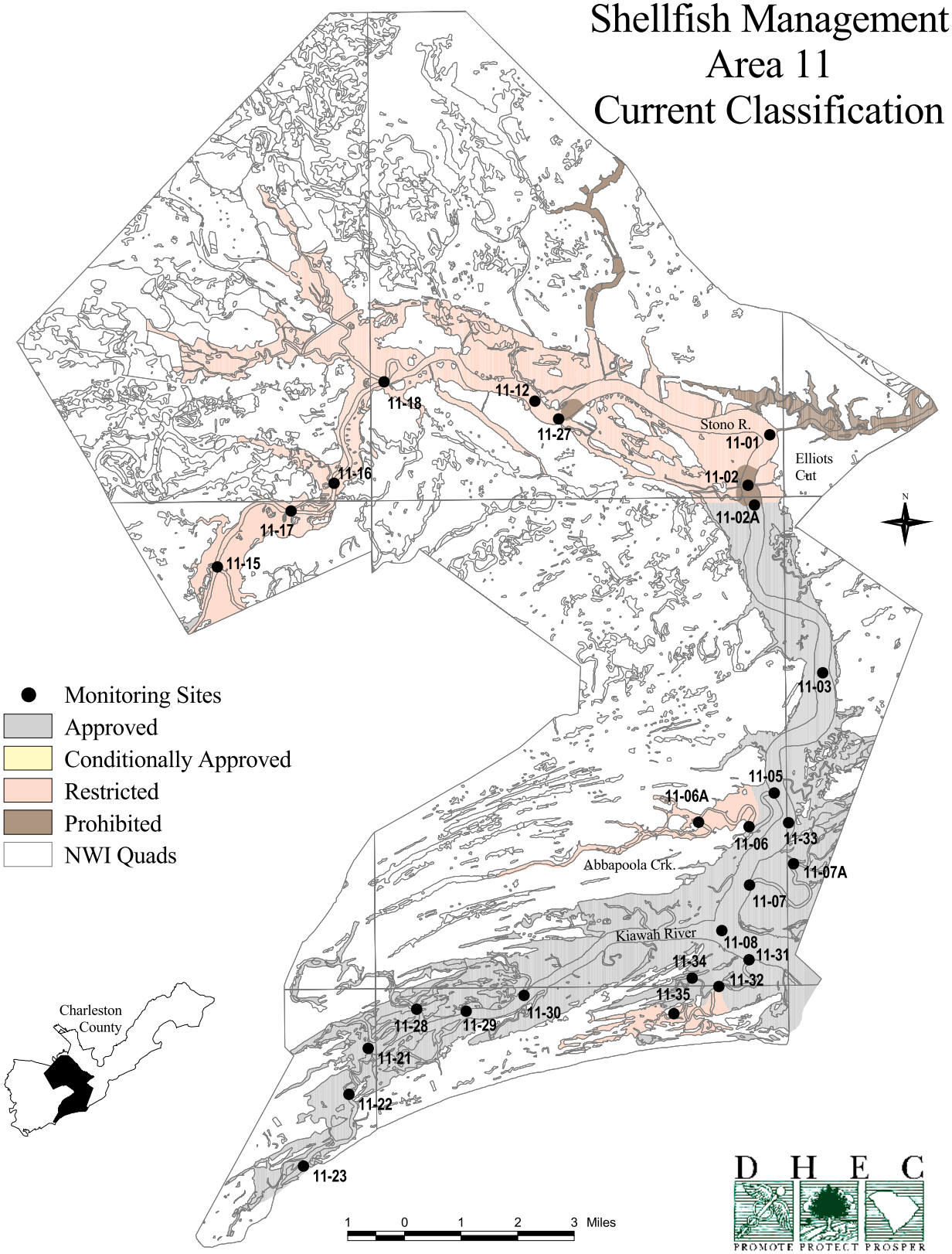

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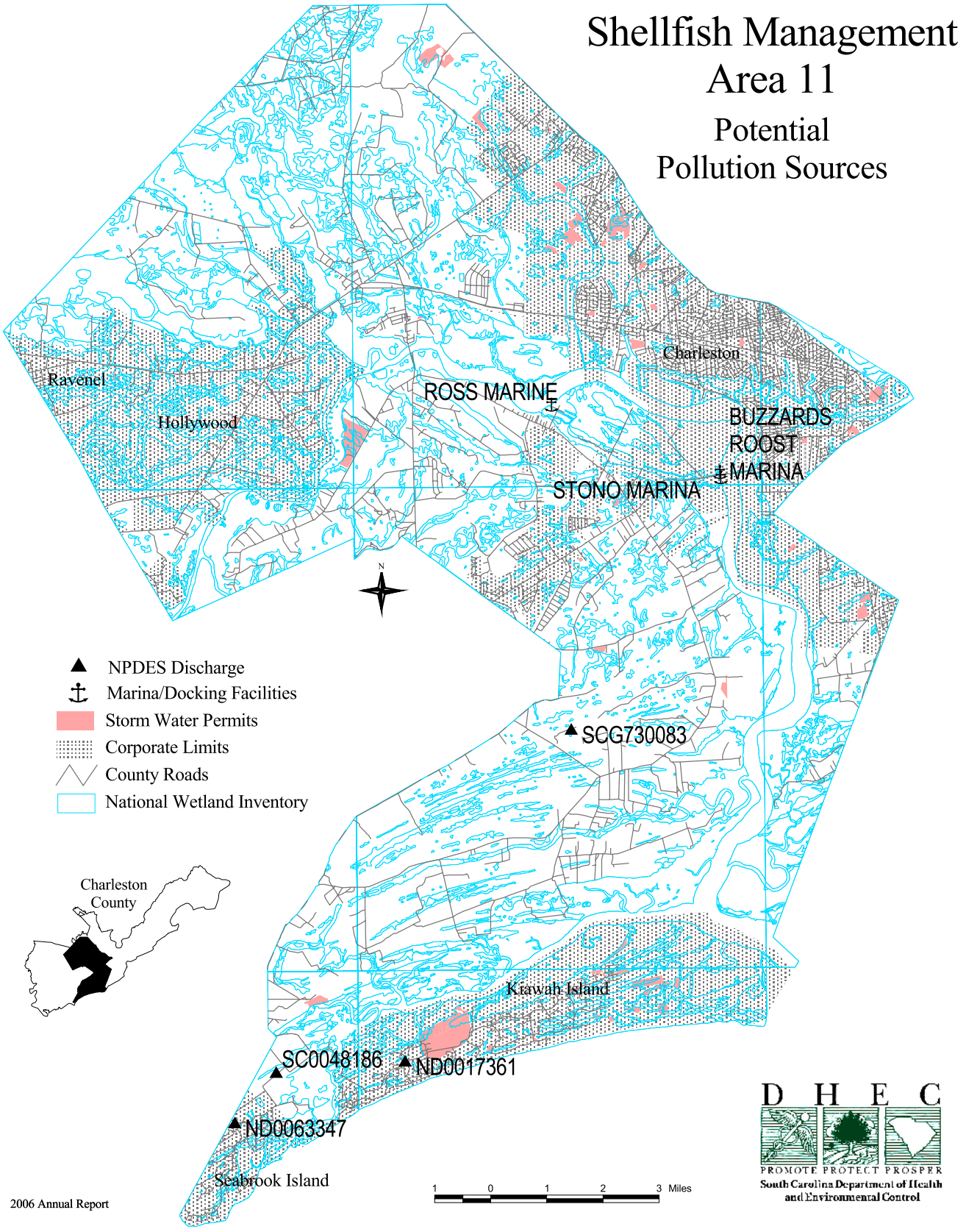
Figure 3.

Shellfish Management Area 11

Potential Pollution Sources



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2006 Annual Report

TABLE #2
Shellfish Management Area 11

FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
from Shellfish Water Quality Sampling Stations between

January 1, 2003 and December 31, 2005

Station #►	2	3	5	6	6A	7	8	10	12	15
Samples	35	35	35	35	35	35	35	35	35	35
GeoMean	8.5	5.6	4.8	8.0	16.3	3.9	3.0	2.7	10.7	11.5
90th %ile	23	21	15	36	86	11	7	5	41	42
Water Qlty	A	A	A	A	R	A	A	A	A	A
Classification	P	A	A	R	R	A	A	A	R	R

Station #►	16	17	18	19	21	22	23	27	28	29
Samples	35	35	35	34	35	35	35	35	35	35
GeoMean	25.6	17.3	16.4	2.7	4.5	5.9	4.6	21.3	3.3	3.0
90th %ile	114	76	78	7	14	20	23	108	9	7
Water Qlty	R	R	R	A	A	A	A	R	A	A
Classification	R	R	R	A	A	A	A	R	A	A

Station #►	30	31	32	33	34	35				
Samples	35	35	34	35	34	34				
GeoMean	3.2	3.4	6.5	4.6	7.2	14.4				
90th %ile	9	10	35	15	41	70				
Water Qlty	A	A	A	A	A	R				
Classification	A	A	R	A	A	R				

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

TABLE #2-A
Shellfish Management Area 11

AMENDED FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
from Shellfish Water Quality Sampling Stations between

January 1, 2003 and December 31, 2005
(Excludes October 2005 through December 2005 Data)

Station #►	2	3	5	6	6A	7	8	10	12	15
Samples	32	32	32	32	32	32	32	32	32	32
GeoMean	7.8	5.2	4.3	7.0	13.4	3.5	2.9	2.4	9.5	10.6
90th %ile	20	19	12	27	57	9	7	4	32	39
Water Qlty	A	A	A	A	R	A	A	A	A	A
Classification	P	A	A	R	R	A	A	A	R	R

Station #►	16	17	18	19	21	22	23	27	28	29
Samples	32	32	32	31	32	32	32	32	32	32
GeoMean	23.7	15.3	14.5	2.6	4.2	5.7	3.9	19.3	2.8	2.9
90th %ile	104	61	58	5	12	17	15	96	6	7
Water Qlty	R	R	R	A	A	A	A	R	A	A
Classification	R	R	R	A	A	A	A	R	A	A

Station #►	30	31	32	33	34	35				
Samples	32	32	31	32	31	31				
GeoMean	2.9	3.0	5.8	4.0	6.3	12.9				
90th %ile	6	7	28	11	31	55				
Water Qlty	A	A	A	A	A	R				
Classification	A	A	R	A	A	R				

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

TABLE #3

Water Quality
Sampling Stations Data

Shellfish Management Area 11

Detailed data for each shellfish monitoring station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained by writing South Carolina's Department of Health and Environmental Control – Freedom of Information office at the address below.

Freedom of Information
SC Dept. of Health & Envir. Control
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

TABLE #4

Rainfall Data

Shellfish Management Area 11

SOURCE:
Rainfall data provided by
Charleston Commissioners of Public Works
Plum Island Wastewater Treatment Plant, James Island, South Carolina

AREA 11 ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: Charleston Commissioner of Public Works

Plum Island Wastewater Treatment Plant (James Island, SC)

2003	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st			0.55		0.10							
2nd												
3rd			0.10			0.70		0.90			0.30	0.40
4th						0.50		0.60				2.70
5th			0.10						1.50			
6th		0.50	0.60		1.00	0.60		0.10	5.00			
7th			0.60	0.60		0.50			0.30			
8th				2.50		0.20			0.60			
9th		0.10		0.30								
10th		0.20		0.30								0.50
11th												
12th												
13th			0.40			0.10						0.40
14th			0.90				3.50		0.20			0.60
15th			0.10		0.80							
16th		0.55			0.30							
17th			0.70		0.60		0.80			0.10		
18th					1.30	0.80	1.10	0.70				
19th			0.10				0.80				0.20	
20th			1.20									
21st	0.20											
22th	**0.45**	0.50			1.15				0.10			
23rd	0.10						0.80					
24th												
25th				5.00			0.60					
26th		0.30		0.20			0.40					
27th		0.40			0.60		0.20			0.10		
28th		0.10	0.10			1.30	0.50			2.20	0.30	
29th												
30th			0.20									
31st					0.20							

(Monthly Figures) **Year's Rainfall Total:** **55.20**

TOTAL	0.75	2.65	5.65	8.90	6.05	4.70	8.70	2.30	7.70	2.40	0.80	4.60
MAX	0.45	0.55	1.20	5.00	1.30	1.30	3.50	0.90	5.00	2.20	0.30	2.70
MIN	0.10	0.10	0.10	0.20	0.10	0.10	0.20	0.10	0.10	0.10	0.20	0.40
AVG	0.25	0.33	0.43	1.48	0.67	0.59	0.97	0.58	1.28	0.80	0.27	0.92

"ND"/"--" = no data (Shaded/bold entries are the dates shellfish water samples were taken.) 10a,10b,11

AREA 11 ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: Charleston Commissioner of Public Works

Plum Island Wastewater Treatment Plant (James Island, SC)

2004	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.00	1.10	0.00	0.50	0.10	0.50	0.00	0.00	0.00
2nd	0.00	0.70	0.00	0.00	0.70	0.00	0.00	**0.00**	0.00	2.50	0.00	0.00
3rd	0.00	**0.00**	0.00	0.00	0.20	0.00	0.00	0.10	0.00	0.20	0.00	0.00
4th	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.20	0.00
5th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6th	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00
7th	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00
8th	0.10	0.00	**0.00**	0.50	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
9th	0.60	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
10th	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	0.00	0.00	0.00
11th	0.00	0.70	0.00	0.10	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12th	0.00	1.00	0.00	0.60	0.00	0.00	0.00	3.60	0.00	0.00	0.10	0.00
13th	0.00	0.00	0.00	0.50	0.00	0.00	0.00	1.20	0.65	0.00	0.00	**0.00**
14th	0.00	0.70	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.00
15th	0.00	0.20	0.20	0.00	0.00	0.30	0.00	1.20	**0.00**	0.80	0.00	0.00
16th	0.00	0.10	0.20	0.00	0.30	1.10	0.00	0.00	0.00	0.00	**0.00**	0.00
17th	0.10	0.30	0.00	0.00	0.00	0.40	0.00	0.40	0.00	0.00	0.00	0.00
18th	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.20	0.00	**0.80**	0.00	0.00
19th	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00
20th	0.00	0.00	0.00	**0.00**	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00
21st	**0.00**	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.20	0.00
22th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	0.00	0.00	0.00	0.00
23rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00
24th	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00
25th	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	2.00
26th	1.10	0.50	0.00	0.60	0.00	0.00	**0.00**	0.00	0.80	0.00	0.00	0.60
27th	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.10	0.50	0.00	0.90	0.00
28th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00
29th	0.00	0.00	0.00	0.00	0.00	0.00	0.95	3.90	0.00	0.00	0.00	0.00
30th	0.00		0.10	2.40	0.00	0.70	0.00	0.15	0.00	0.00	0.00	0.00
31st	0.00		0.00		0.00		0.20	0.30		0.00		0.00

(Monthly Figures) **Year's Rainfall Total: 56.32**

TOTAL	1.90	5.65	0.52	4.70	2.30	3.40	5.55	18.25	5.65	4.40	1.40	2.60
MAX	1.10	1.20	0.20	2.40	1.10	1.10	1.60	3.90	3.00	2.50	0.90	2.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.06	0.19	0.02	0.16	0.07	0.11	0.18	0.59	0.19	0.14	0.05	0.08

"ND"/"--" = no data (Shaded/bold entries are the dates shellfish water samples were taken.) 10a,10b,11

AREA 11 ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: Charleston Commissioner of Public Works

Plum Island Wastewater Treatment Plant (James Island, SC)

2005	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.70	0.00	0.10	0.30	0.20	0.00	0.00	0.00	0.00
2nd	0.00	0.00	0.00	0.50	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3rd	0.00	0.90	0.00	0.00	0.00	0.40	0.40	0.00	0.00	0.00	0.00	0.00
4th	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	**0.00**	0.00	0.00
5th	0.00	0.00	0.00	0.00	1.50	0.60	**0.10**	0.00	0.00	1.60	0.00	**1.00**
6th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.60	0.00	0.00
7th	0.00	0.00	0.10	0.50	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00
8th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.80
9th	0.00	**0.20**	0.00	0.00	0.00	0.00	1.00	**0.40**	0.00	0.00	0.00	0.00
10th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00
11th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
12th	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.20	0.00	0.10	0.00	0.00
13th	0.20	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14th	0.40	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
15th	0.00	0.00	**0.00**	0.00	0.10	0.00	0.00	0.70	0.00	0.00	0.10	0.30
16th	0.00	0.00	1.20	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.00	0.00	0.00	0.00	0.50	0.00	0.00	1.50	0.00	0.00	0.00	1.00
18th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00
19th	0.00	0.00	0.00	**0.00**	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00
20th	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	4.00	0.00
21st	0.00	0.30	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.70	0.00
22th	0.00	0.00	3.25	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23rd	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.20	0.00	0.00
24th	**0.00**	0.30	0.00	0.00	0.00	0.00	0.00	2.20	0.00	0.70	0.00	0.00
25th	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
26th	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.50	**0.00**	0.00	0.00	0.00
27th	0.00	2.50	3.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.20	0.00
28th	0.00	0.00	0.40	0.00	0.00	3.50	0.00	0.00	6.10	0.00	**0.10**	0.00
29th	0.70	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.10	0.00
30th	0.00		0.00	0.00	2.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00
31st	0.00		0.00		1.50		0.50	0.00		0.00		0.00

(Monthly Figures) **Year's Rainfall Total:** **64.05**

TOTAL	1.40	4.50	8.35	2.00	8.80	9.10	2.30	7.70	6.50	5.00	5.20	3.20
MAX	0.70	2.50	3.25	0.70	3.00	3.50	1.00	2.20	6.10	1.60	4.00	1.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.05	0.16	0.27	0.07	0.28	0.30	0.07	0.25	0.22	0.16	0.17	0.10

"ND"/"--" = no data (Shaded/bold entries are the dates shellfish water samples were taken.) 10a,10b,11